

Every MMDVM board has the potential to be calibrated slightly different due to the tolerances of components during assembly. The following steps will calibrate the TX and RX of the board.

Setting RX and TX offset with MMDVMCAL

Setting the TX and RX offset will improve the transmission between your radio and your hotspot by lowering the error rate (BER). **Just a note**, TX and RX is referring to the hotspot. Meaning TX is the hotspot transmitting RF to your radio and RX is the hotspot receiving RF from your radio.

MMDVMCAL Instructions

While logged in to your Pi-Star dashboard, click on Expert Mode in the top menu and then on SSH Access. When the SSH window opens up type in your user name and password (default user is pi-star and default password is raspberry). Once the command prompt appears type in the following.

```
sudo pistar-mmdvmcal
```

The calibration program will begin and a list of commands will appear. (Pressing H at any time will bring up the command list)

The first step is to tune the TX frequency of the hotspot. Press the E key and “Enter Frequency” will come up. Enter the frequency you have the hotspot and your radio set to and click enter.

REMEMBER...you are entering in hertz so, for example, 433.200 Mhz will be entered in as 433200000. Next, set your radio to FM mode and click the space bar. “Set Transmitter ON” will appear and you should hear a tone on the radio. Now press the F key. You will see a new frequency show in the SSH window. Keep pressing the F key until the radio drops the tone carrier. Write this frequency down. Now hold the SHIFT button and press F again. You will see the frequency in the SSH window going in the opposite direction and the radio should start transmitting the tone again. Continue holding SHIFT and pressing the F key until the radio drops the tone carrier again. Write this frequency down.

Take the two frequencies you wrote down and add them together. Now divide them by 2 and this will be your center TX frequency. Write this number down as you will use this to set the TX offset.

Press H to bring up the command list again.

Next we move onto the RX calibration. This one is very fussy and if it is even off a small amount the hotspot may not hear your radio. I will be using YSF for this example but the steps are the same for DMR, D-Star, etc. Make sure to choose the correct mode by referring to the command list.

NOTE...The radio will now need to be in digital mode.

For YSF, Hold the SHIFT key and press J. “BER Test Mode for YSF” will appear. Set your radio to digital mode and press the PTT. If your hotspot is receiving you will now see a packet list form and continue as you hold the PTT. If not you will need to click the F key (or SHIFT and F) to adjust the hotspot RX frequency. A good starting point would be the center TX frequency you calculated above. Try going up and down from this point while pushing the PTT until the hotspot receives and the packet list starts tabulating. See image below:

The screenshot shows the Pi-Star Digital Voice Expert Editors interface. At the top, there is a navigation menu with links for Dashboard, Admin, Update, Upgrade, Backup/Restore, and Configuration. Below this, there are two rows of quick and full edit links for various services like DStarRepeater, ircDDBGateway, TimeServer, MMDVMHost, DMR GW, YSF GW, P25 GW, NXDN GW, DAPNET GW, etc. The main terminal window displays the following text:

```

SSH - Pi-Star
n BER Test Mode (FEC) for NXDN
g POCSAG 600Hz Test Pattern
S/s RSSI Mode
I/i Interrupt Counter Mode
V/v Display version of MMDVMCal
<space> Toggle transmit
BER Test Mode (FEC) for YSF
YSF voice header received
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.988% (4/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.494% (2/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.247% (1/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.000% (0/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.494% (2/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.247% (1/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.247% (1/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.247% (1/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.000% (0/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.000% (0/405)
YSF, V/D Mode 2, Repetition FEC BER % (errs): 0.741% (3/405)
YSF voice end received, total frames: 11, bits: 4455, errors: 15, BER: 0.336
70%

```

Once the list starts you can continue pressing F or SHIFT F while watching the errs percentage. Once you get it as low as you can, release the PTT and write down the frequency you stopped at. (you can scroll up above the packet list to see what frequency you stopped at)

Now press the Q key to exit the program. This will start the services on your hotspot and take you back to the command prompt in the SSH window.

In the top menu click on MMDVMHost. It may ask you to confirm leaving this page. If so click on leave page. In the MMDVMHost page scroll down to the Modem section (usually the 7th section from the top) and find where it say RXOffset and TXOffset. Here is where you will enter the the correction you determined using MMDVMCal. Below is an example of how you will enter it.

For example, if your frequency is set to 433.200Mhz and the RX frequency you figured was 433202110 then you would enter 2110 in the RXOffset. **Another example** shows it could be a negative number. If your set to 433.200Mhz and your RX frequency figured at 433197760 you would enter -2240 as the RXOffset.

Repeat the same steps for the TXOffset using the center frequency you calculated using MMDVMCal.

Scroll to the bottom of the Modem section and click apply changes.

Your hotspot should now be communicating with your radio reliably.